TVU networks

TVUPack Mini™

Operating Guide

Model: TM5000

Version 4.0

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FCC/CE Compliance

Federal Communications Commission (FCC) Regulation of ENG Mobile Systems

The FCC provides specific policies and procedures related to radio frequency (RF) emissions in mobile and portable devices. The FCC outlines test requirements and specific test procedures based on the type of device. These test requirements and procedures can also cover Specific Absorption Rates (SAR) for RF.

The TVUPack Mini device has always conformed to all applicable FCC regulations covering mobile systems for electronic news gathering. All required tests for the TVUPack Mini device as outlined in the regulations were performed by a third party testing lab which issued a certificate of compliance for the TVUPack Mini. The certificate is applicable to both the FCC and CE. Additionally, the data modems used in TVUPack are commercially available off-the-shelf brands and have been FCC and carrier certified.

Supporting documentation demonstrating TVUPack Mini's compliance with the applicable FCC regulations is available upon request. Please contact us at +1.650.969.6732 for assistance and questions regarding approved modem cards for use with TVUPack Mini.

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ABOUT THIS GUIDE

Thank you for purchasing the TVUPack Mini. This operational guide provides instruction for setting up the unit and brief overview of the available components for this particular model (TM5000).

Before you begin setting up the unit, we suggest that you first identify the devices you intend to use with TVUPack Mini including: cameras, cables, power sources, modems and unit accessories. Then decide how you intend to mount the unit (i.e. mounted to a belt, on-camera, stand-alone, etc.). Once these decisions are determined, simply follow the steps in this guide to setup your new TVUPack Mini.

TVUPACK MINI STANDARD COMPONENTS

The TVUPack Mini includes the following standard components:

- Main Module
- AC Adapter
- USB Hotspot Adapter
- USB Wi-Fi Adapter
- Belt Clip
- Operation Guide and User Manual

TVUPACK MINI OPTIONAL COMPONENTS

The optional components below are also available for the TVUPACK Mini:

- Anton Bauer or V-Mount Battery
- Anton Bauer or V-Mount Battery Charger
- Generic USB Modems
- Compact Modem Cover (enclosure for up to four Huawei Generic 3G USB Modems)
- Full-Size Modem Cover (enclosure for up to six USB modems)
- Anton Bauer Camera Mount Kit
- V-Mount Camera Mount Kit
- Anton Bauer Belt Mount Kit
- Modem Module
- Camera Mount
- V-Mount Belt Mount Kit
- External iPod Control
- Anton Bauer to V-Mount Adapter
- Ethernet Cable
- AC Car Adapter
- Universal Adaptor

Purchasing Camera and Belt Mount Kits

All camera and belt mounts are sold separately. Contact TVU Networks at support@tvupack.com or 1.650.440.4812 assistance in acquiring the right mount for your needs.

✍ **Note**: If a component is missing, please contact TVU Networks at support@tvupack.com or 1.650.440.4812.

TVUPack Mini Setup Instructions

The next sections cover setup instructions for:

- Mounting the TVUPack Mini to camera
- Mounting the TVUPack Mini to belt
- Connecting the power supply
- Connecting the modem
- Turning on the TVUPack Mini

Mounting the TVUPack Mini to a Camera

Camera Mount Kits:

To mount the TVUPack Mini to a camera, you will either need the Anton Bauer (3 Stud) or V-Mount camera mount kit (pictured in Figure 1). Contact TVU Customer Support if you do not have either mounting accessory.

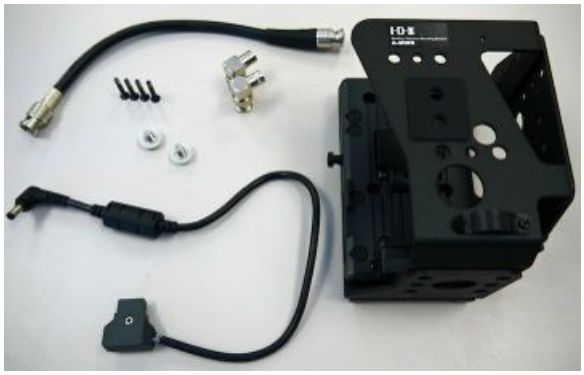


Figure 1

Anton Bauer Camera Mount Kit

The following tool is required to install the Anton Bauer Mount Kit:

- Philips screwdriver

✍ **Note:** If you need assistance installing TVUPack Mini on the camera, please contact the TVU networks support team or contact your TVU networks reseller.

Follow the steps on the next page to attach the Anton Bauer mount to a camera:

1. Remove the four screws that attach the camera to the existing Anton Bauer plate from your camera.

Figure 2

2. Pull the plate away from the camera and disconnect the cables.

3. Slide the camera-side of the camera mount bracket toward the camera with the cables going through the center cavity, and then reattach the cables - making sure to properly harness the cables so they do not get pinched.

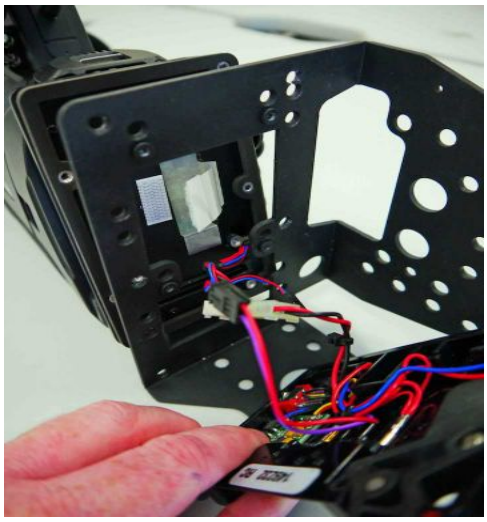


Figure 3

Note: It may be necessary to disassemble the mount bracket (4 screws) first so that it's easier to mount.

4. Reattach the Anton Bauer battery plate by aligning the holes on the camera mount plate to those on the camera and the Anton Bauer plate. (Use the provided screws if the existing screws are not long enough.)

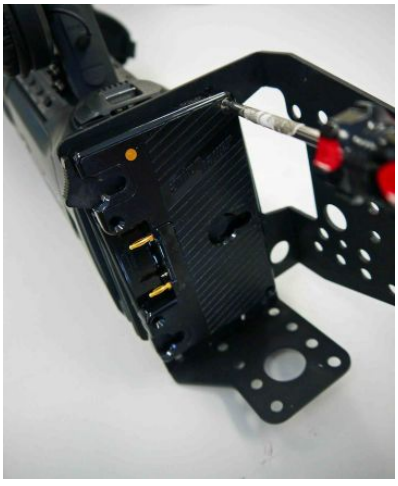


Figure 4

5. Use the provided screws and nylon washers to attach the TVUPack Mini side of the bracket to the Mini unit. Note the orientation of the bracket pictured in Figure 5. The unit should be aligned vertically with the camera

Figure 5

6. Now reassemble the camera mount bracket with the Mini attached. Once assembled, use a coin to tighten the mount screws to the Mini.

Figure 6

7. Locate the power tap (D-tap) connector on the top right side of the Anton Bauer plate and connect the supplied D-tap cable to this connector and the other end to the DC input on Mini. Use the cable restrain for the Mini Jack connector to prevent it from coming loose.

Figure 7

8. Connect the supplied SDI cable to the mini (use the right angle adapter if necessary) and then connect the other end to the camera's SDI out port. Alternatively, connect the HDMI or Composite cable to the camera.

Figure 8

The system is now ready for use once a battery is inserted to the camera.

V-Mount Camera Mount Kit

The V-Mount kit installation is very similar to that of the Anton Bauer kit, except it is not necessary to remove the camera's battery mount plate first. The V-mount camera mount connects directly to the existing V-Mount plate on the camera. Once mounted, please repeat steps 5 through 8 to complete the installation.

MOUNTING TVUPACK MINI TO A BELT

The following tool is required to install the Anton Bauer Belt Mount Kit:

- Philips screwdriver

✎ **Note:** If you need assistance installing TVUPack Mini on the camera, please contact TVU Customer Support.

Anton Bauer Belt Mount Kit

Following these steps to attach the TVUPack Mini to the Anton Bauer Belt Mount:

1. Mount the Belt Clip to the rear of the TVUPack Mini using the supplied screws.

Figure 9

2. Select the desired location on the belt and slide the Belt Clip over the belt until secure.

Figure 10

3. Mount a battery to the belt battery plate. Locate the Power Tap (D-Tap) connector on the battery plate and attach the supplied Power Tap cable.

4. Now connect the other end to the DC input on Mini. Use the cable restrain for the Mini Jack connector to prevent it from coming loose.

Figure 11

5. Attach the belt securely around your waste.

6. You have the option of using the supplied 4-pin XLR cable on the battery plate to power a camera (Anton Bauer version only).

7. Connect a video input to TVUPack Mini.

8. Press the power button to turn the unit on.

Figure 12

Belt Mount Pack for Sony BP-U Series Batteries

This belt mount pack conveniently fits the TVUPack Mini and a Sony BP-U Series battery into a small bag that has an adjustable belt to be worn around the waist. An attachable shoulder strap is also available.

The belt mount pack comes with a battery mounting plate. Simple attach the battery to the battery mount and plug in the Mini via the DC-input. Then put the mounting plate along with the attached battery and TVUPack Mini into the belt pack.

Battery & TVUPack Mini Mounting plate

V-Mount Camera Mount Kit

The V-Mount kit installation is very similar to the Anton Bauer kit, **except the supplied 4-pin XLR to mini jack adapter should be used for the power input**. Repeat the steps above to complete the installation.

Data Cards

The TVUPack Mini supports 3G and 4G wireless cellular data cards. If you did not lease your data cards from TVU Networks, make sure that the cards you acquire are compatible with Linux and obtain the dial number, username, password and APN if applicable from the provider. For the latest supported data cards or for any other assistance with data card installation, contact Customer Support at support@tvupack.com or +1.650.440.4812.

You may purchase cards from any mobile network provider. To ensure network diversity, we recommend you purchase at least three data cards from a minimum of two different mobile network providers. For example, your three data cards can be comprised of one AT&T, one Verizon and one T-Mobile or two AT&T and one Verizon.

✎ **Note:** Here are two examples of compatible data cards:

Figure 13

International Customer Notice:

In countries where 3G modems use removable SIM cards, TVU Networks currently supports these modems: Huawei E369 and E261. If the operators in your country provide other modem types, contact us about compatibility with the TVUPack Mini.

MODEM ENCLOSURES

There are two different Modem enclosures designed for use with the TVUPack Mini. These are the Compact Modem Cover (accommodates up to four Huawei 3G generic modems) and the Full-Size Modem Cover (accommodates up to six 3G/LTE modems from different manufacturers). To attach the enclosures, you will need a small Philips screwdriver, your chosen modems, hook Velcro strips and the supplied USB extension cables.

Compact Modem Cover

The Compact Modem Cover is designed specifically for use with Huawei E369 3G USB modems. It can accommodate up to four of these modems mounted directly to the top of the TM5000. The Modem Cover consists of two pieces: the **Rim Mount** and the **Top Cover**.

1. Attach the Rim Mount to the top of the TM5000 unit by using the two supplied screws (it may be necessary to first remove the two screws from the top plate prior to assembly).

✎ **Note:** Mount the HotSpot and WiFi adapter prior to attaching the RIM Mount.

Figure 14

2. Utilize slots 1, 3, 5 and 7 to insert up to 4 Huawei E369 modems.

✍ **Note:** Never install modems with SIM cards from the same carrier next to each other. And never install modems in slots 4 and 6 if modems are present in slots 3 and 5.

Figure 15

3. Connect the USB fan located inside the top cover to slot 4 or 6 and then place the top cover over the modems. The Top Cover uses magnets to secure to the Rim Mount.

Figure 16

4. The system is now ready for use.

✍ **Note:** Be careful not to block any air vents during operation.

Figure 17

Full-Size Modem Cover

The Full-Size Modem Cover is designed to support up to six USB modems from different manufacturers. Modems attach to the inside of the Modem Module utilizing Velcro loop (for ultimate flexibility) and connect to the TM5000 USB ports via supplied USB extension cables. The Modem Module mounts to the side and top of the TM5000 via two mounting slots and two mounting screws. It features a flip-top door on the topside to accommodate odd sized modems. The Full-Size Modem Cover uses the TM5000 system fan to cool modems.

1. Lay the Full Size Modem Cover down and place modems inside the enclosure.

2. Use Velcro to position each modem and connect to one of the supplied USB cables.

3. Modems and cables must not protrude beyond the side of the Module. Avoid overlapping modems.

4. Before mounting the Full Size Modem Cover, open the flip top door and insert USB extension cables into TM5000. Do not completely install the Full-Size Modem Cover until all cables are connected.

Figure 18

Figure 19

5. When using six modems - all in the enclosure - use the right angle (down) cables for slots 1, 3, 5 and 7.

6. Use right angle (left side) cables for slots 4 and 6. It may be necessary to change configurations to suite different modem set.

Figure 20

7. Once all cables are inserted, slide the Full-Size Modem Cover into the two mounting slots in the base of the rear panel cables.

Figure 21

8. Push the module down so that it is flush with the TM5000, and be careful not to pinch the USB cables.

Figure 22

9. Fasten the top of the Full-Size Modem Cover down using the supplied screws. It may be necessary to first remove the two screws from the top plate prior to assembly.

✎ **Note:** If needed, insert modems directly to the TM5000 USB ports via the open flip top door.

.

10. The system is now ready for use.

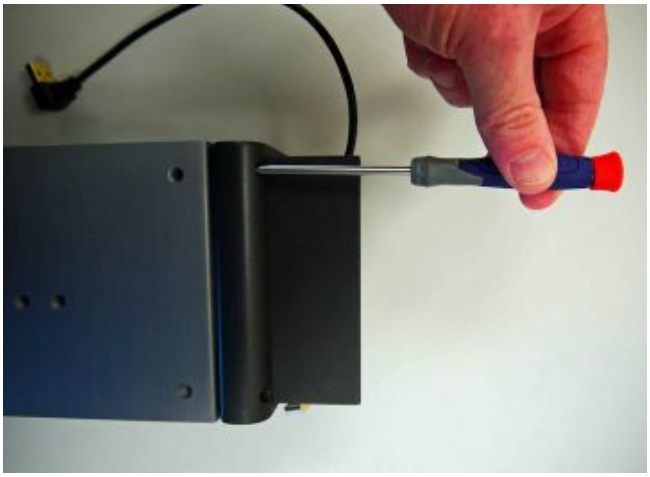


Figure 23

POWER SUPPLY OPTIONS

The TVUPack Mini consists of the following power supply components:

- External AC adapter – 19V (4.3A).
- Optional Camera Mount Kits – Designed for Mini to mount to a full size camera, which utilizes either Anton Bauer or V-Mount battery systems. TVUPack Mini taps power from the camera's battery system using the supplied D-Tap (Power Tap) cable.
- Optional Belt Mount Kits – Designed for Mini to mount to an Anton Bauer or V-Mount Power Belt. TVUPack Mini interfaces with the battery system using the supplied D-Tap (Power Tap) cable.
- Standalone Battery Power –Requires optional accessory mount plate. Mounts to side of TVUPack Mini system. Will accept either V-Mount or Anton/Bauer (3-stud) battery plates. Utilizes external power tap for connection.
- Reserve Battery Power – TVUPack Mini has a reserve battery system that will power the device for about two minutes so that you can change the external battery. This allows continuous operation with a single external battery.

✍ **Note:** TVUPack Mini can be used with DC power sources ranging from 11 to 19V.

TVUPack Mini Panels

Here is a brief description of the functionality of each of the panels (front, rear, top, and base) that comprise the TVUPack Mini.

Front Panel

A. Power:
On - Press the power button to turn on unit. The green light indicates device is on.
Off – Press and hold the power button for 3 seconds to turn the device off. (The message "Unit is powering down" is displayed under video preview.)

Figure 24

B. Live
- Live - Green
- Standby - Yellow
- Offline - Off

C. Input:
- Valid Input – Green
- Invalid Input - Red

D. HD/SD
- HD – Green
- SD - Yellow

E. Reserve Battery
Green light displayed when the internal reserve battery.

F. Multi-color LEDs for each USB port.
- Green - Connected
- Yellow - Dialing /Connected
- Red - Error
- Off - No connection

G. LAN connection
- Green - Connected
- Off - No connection

H. SIGNAL
Displays overall signal strength based on R bit-rate/latency settings. Would alert to significant signal drop-off.
LEDs:
- Good - Green
- Caution - Yellow
- No Signal - Red

I. Mini LDC Monitor

J. Battery indicator
Battery Icon displays when device is in reserve mode. (You will see the power plug icon when the AC adaptor is in use.
VBR: Bandwidth updates in real time.
R: Indicates which receiver is connected.

Rear Panel

CAUTION: Do not block any of TVUPack Mini's air vents during use.

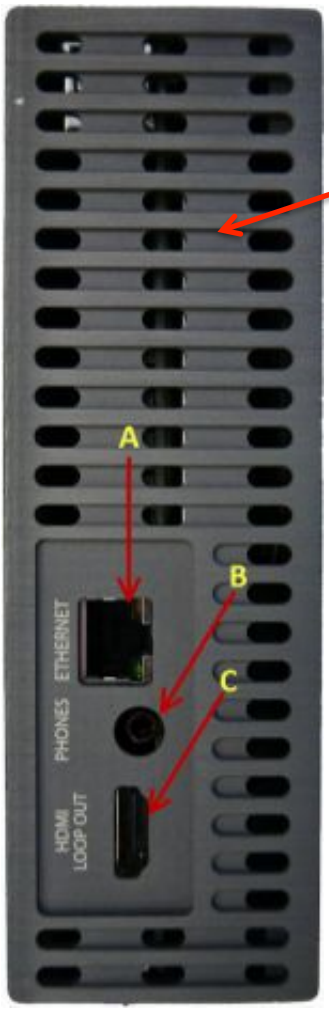


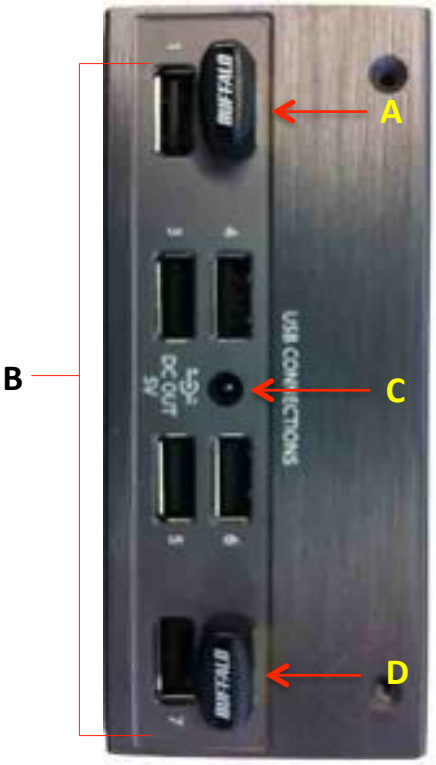
Figure 25

A. Ethernet
- GbE Ethernet

B. Phones

C. HDMI LOOP OUT

Top



A. **Wi-Fi Adapter (Always use Port 2)**

B. **US Ports 1, 3, 4, 5, 6 and 7. For USB Modem Connection**

C. **5V, 7A DC Output**

D. **HotSpot Adapter (Always use Port 8)**

Figure 26

Base

A. **DC In – 11-18**

B. **Unbalanced Analog Audio In 1**

C. **Unbalanced Analog Audio In 2**

D. **Composite Video In**

E. **HD/SD-SDI In (with embedded audio)**

F. **HDMI (with embedded a audio)**

Figure 27

TVUPack Mini Configuration and Monitor Interface

TVUPack Mini configuration and monitoring is handled via a web interface. This interface can be accessed using a standard web browser connected to the Mini's HotSpot, and is compatible with the following web browsers:

- **Safari** – MAC
- **Internet Explorer** - Windows

Connecting to the Hotspot

It is generally expected that a Hotspot dongle is always connected to the pack and always available.

1) Hotspot should always be inserted into USB Slot 8.
2) The Hotspot broadcast SSID is "TVUPACK MINI_XXXX" where XXXX is the last four digits of the Mini PID. The SSID security is WPA2 and the password is the last eight digits of the PID (all uppercase).
3) Once connected to the Hotspot, go to http://192.168.3.1 to access the Pack monitor/control screen interface.

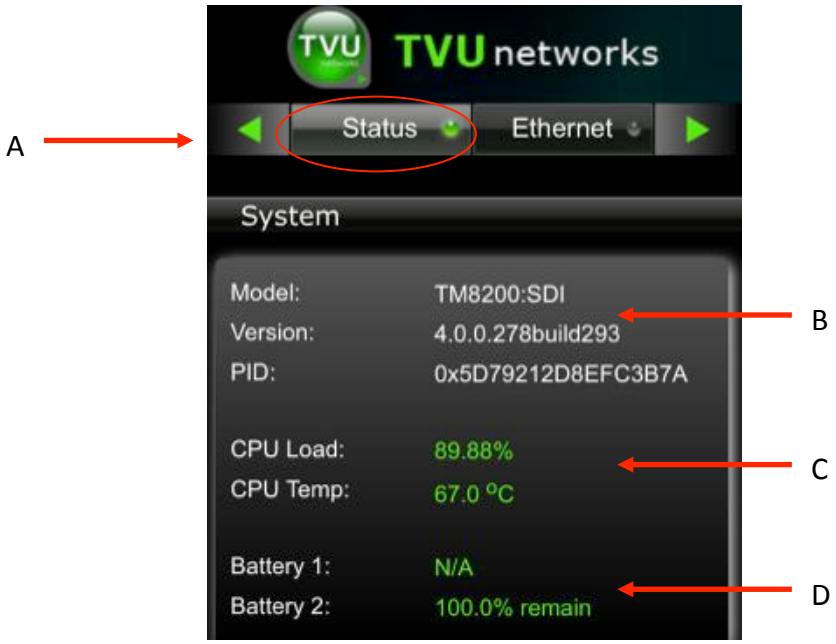
WEB MENU SELECTION TABS

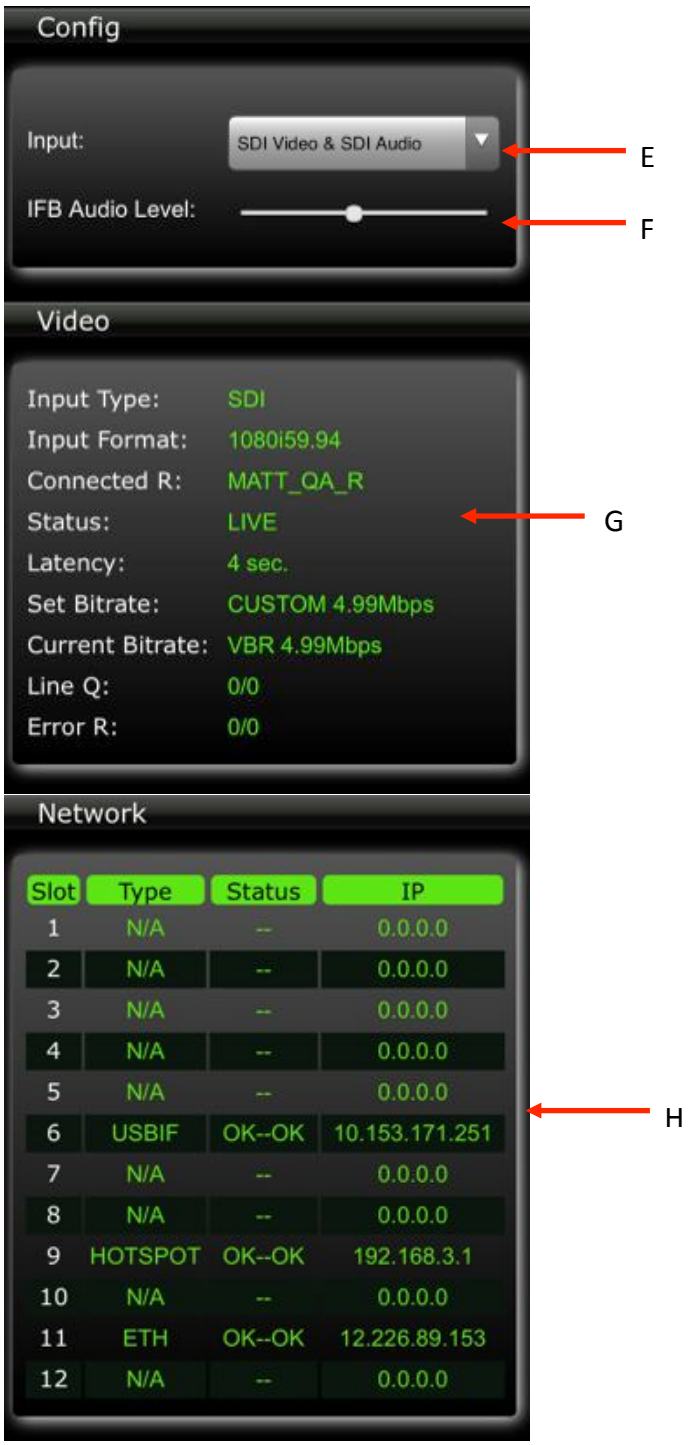
From a web browser, the TVU Transmitter status can be monitored and various parts of the transmission can be controlled. This interface can be accessed using a standard web browser connected to the TVUPack's Hotspot. See *Connecting to the Hotspot (page 18)* for details on how to connect to the Hotspot.

Note: The images below are examples of how the screen would appear on an iPhone web browser

TVUPack Transmitter Status Screen

The Status tab provides system information.



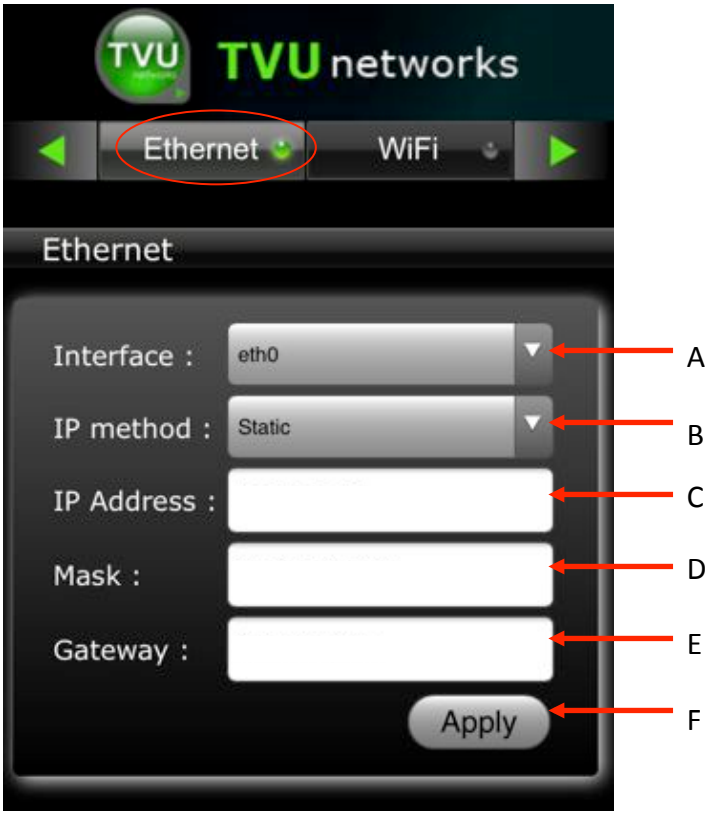


Label	**TVUPack Transmitter Status Screen Description**
A	Scroll bar that allows users to monitor and control all aspects of a transmission including data cards, Ethernet, Wi-Fi, BGAN, Receiver, and return video feed.
B	Information regarding a particular TVUPack such as model number, version number, and PID.
C	**CPU**: Current CPU capacity and temperature

Label	TVUPack Transmitter Status Screen Description
D	**Battery**: Main battery status
E	**Input**: Input source
F	**IFB Audio Level:** Change the audio level of the IFB function
G	**Video**: Transmission information and status
H	**Network**: Modem card information including type, connectivity, and IP address all organized by slot number

Ethernet

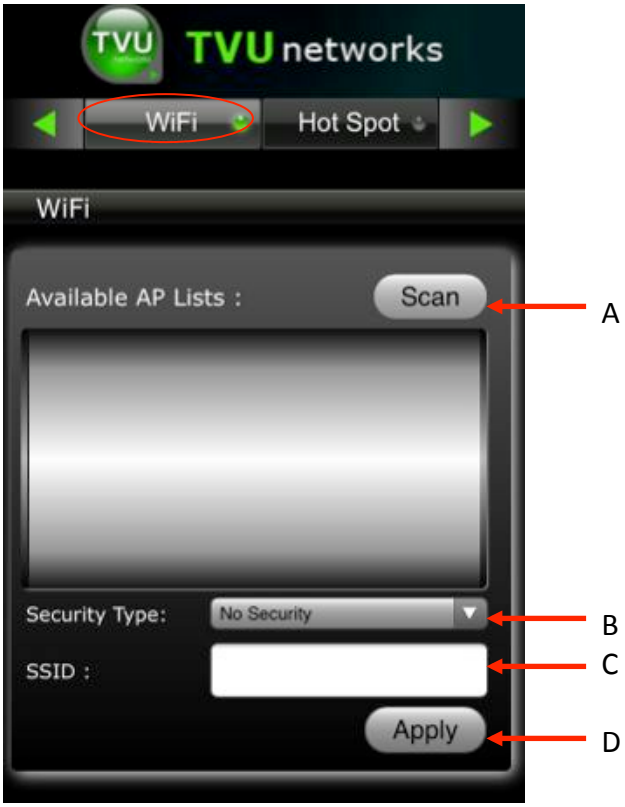
The Ethernet screen provides configuration and set-up information.



Label	TVUPack Transmitter Ethernet Status Screen Description
A	**Interface**: Select either Ethernet or USB from drop-down menu
B	**IP Method**: Select either Static or DHCP
C	**IP Address:** Entered manually if in Static mode; automatically generated if in DHCP mode
D	**Mask**: Entered manually if in Static mode; automatically generated if in DHCP mode
E	**Gateway**: Entered manually if in Static mode; automatically generated if in DHCP mode
F	**Apply**: Press Apply for the changes to take effect

WiFi

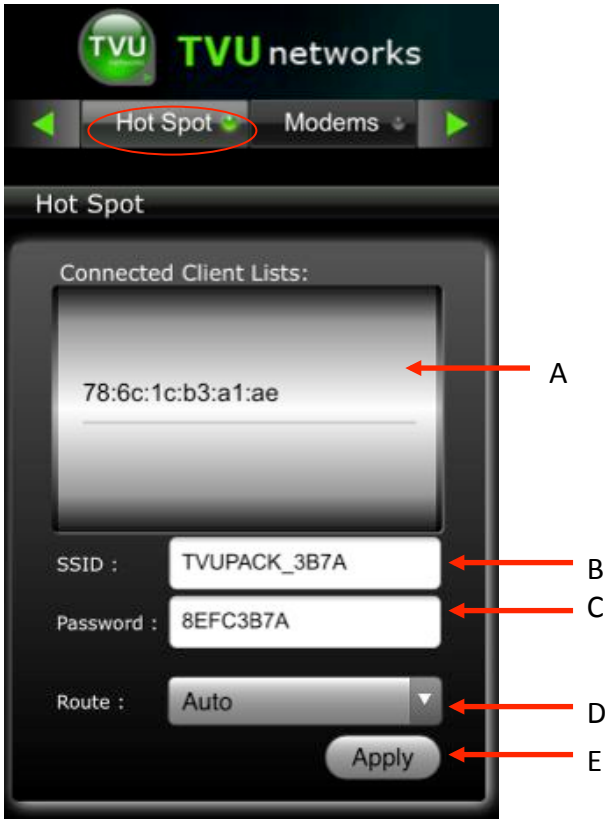
The WiFi screen provides configuration information and access to change the WiFi settings. The WiFi card should always be placed in port 9 on the TVU transmitter.



Label	TVUPack Transmitter Wi-Fi Status Screen Description
A	**Scan**: Scan for available networks and will display the list of available networks to select from the Available AP Lists box.
B	**Security Type:** Drop down menu displays the security type of the connection
C	**SSID**: Wireless network name
D	**Apply**: Press Apply for the changes to take effect

Hotspot

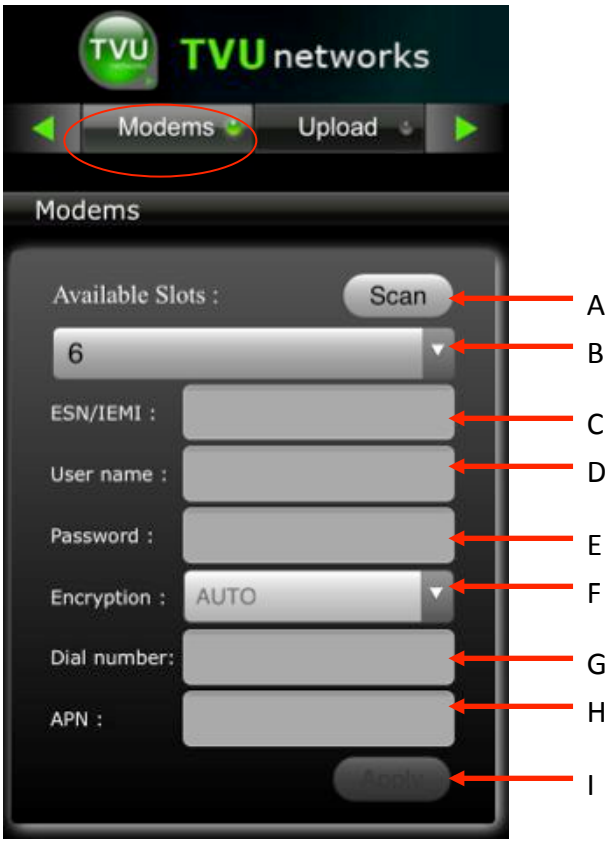
The Hotspot tab provides status information on clients connected via the Hotspot. The Hotspot card should always be placed in the USB port on the TVU Transmitter.



Label	TVUPack Transmitter Hot Spot Status Screen Description
A	**Connected Client Lists**: Displays list of devices connected via Hotspots
B	**SSID**: Allows you to customize the Hotspot SSID
C	**Password**: Allows you to customize Hotspot password (Note: the new password must be 8 characters and does not take affect until the system is rebooted).
D	**Route**: Choose a specific modem, WiFi network, or Ethernet connection, or choose Auto for the Hot Spot to be routed through a random modem connection.
E	**Apply**: Press Apply for the changes to take effect

Modem

The Modem screen provides modem configuration information. Many cellular data cards are automatically detected by the TVUPack and will self-configure. If this is the case, no further action will be required. If a data card needs to be configured, you can use this tab to configure specific data cards.



Label	TVUPack Transmitter Modem Status Screen Description
A	**Scan**: Search for available modems
B	**Available Slots:** Drop-down list of slots that are available for configuration.
C	**ESN/IEMI:** A modem's unique identification number
D	**Username:** Obtain carrier user name information from the network carrier
E	**Password:** Obtain carrier password information from the network carrier
F	**Encryption:** Select the appropriate encryption standard from the drop-down menu
G	**Dial number:** Obtain carrier dial information from the network carrier
H	**APN**: Obtain APN information from the network carrier
I	**Apply**: Press to apply desired changes

BGAN

The BGAN tab provides BGAN transmission information

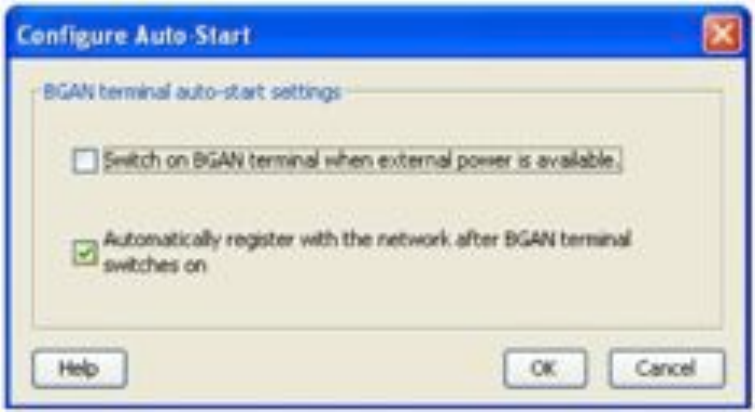
Label	TVUPack BGAN Status Screen Description
A	**Device Name:** Displays the device name
B	**Signal**: Displays the signal strength
C	**Linked**: Indicates if the BGAN is connected
D	**Link Type:** Indicates the BGAN link type
E	Drop down menu that allows for the selection of a specific streaming class

BGAN Configuration

The TVUPack TM5000 can support BGAN Hughes 9201 for automatic data connections. Follow these steps to set up the auto connection:

1. Set up the BGAN device to **Auto Register Network mode** by LaunchPad.

   A. To enable automatic registration, Select **Terminal > AutoStart mode**. The **Configure Auto-Start** screen is displayed:


Configure Auto-Start
BGAN terminal auto-start settings
Switch on BGAN terminal when external power is available
Automatically register with the network after BGAN terminal switches on
Help
OK
Cancel

B. Check **Automatically register with the network after BGAN terminal switches on** and then click **OK**. Then power off the BGAN device.

2. Connect the BGAN to the TM5000 by Ethernet cable.

3. Pointing to satellite by the Web UI of the Pack configuration from iPad or IE, for Hughes 9201, it has signal strength indicators on the panel.

   Note: You may need to manually adjust the equipment location and orientation in order to confirm the signal strength is greater than 60%

4. Set the link mode. “X-stream” is the default mode set up by the TVUPack automatically.

   Note: If the interface connected with the BGAN device is consistently yellow and does not change to green after setting up the “Link Type”, please check whether the BGAN equipment - when connected to a PC - can work normally with LaunchPad’s X-stream mode.

5. Check on the TVUPack’s screen to make sure the BGAN is connected.

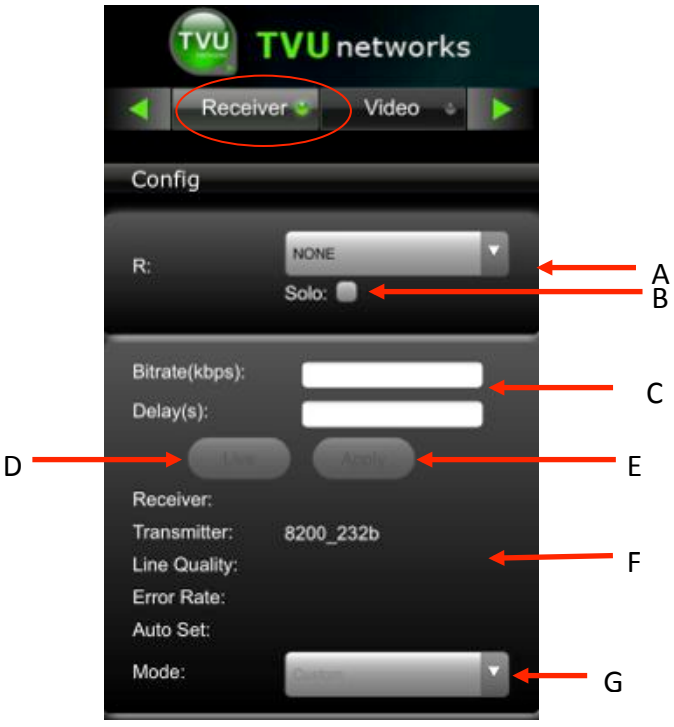
6. Power off the BGAN device to close the connections.

If the BGAN is the only device connected with the Receiver, then the Receiver will automatically change the bitrate and CBR to 80% with four seconds of delay.

If there is no BGAN connected, the menu will display “No Device Detected” as shown below.

Receiver Status

It displays Line Quality and Error Rate information. Touch the Start/Stop Live button to control the live transmission. You use this screen to control Bit Rate and Delay by entering your data in the respective boxes and touching the **Apply** button to set them. This screen also allows you to choose the operational mode provided in the drop down menu at the bottom of the screen: **Interview**, **Normal**, **Fast Moving, SD, and Tape Feed**.



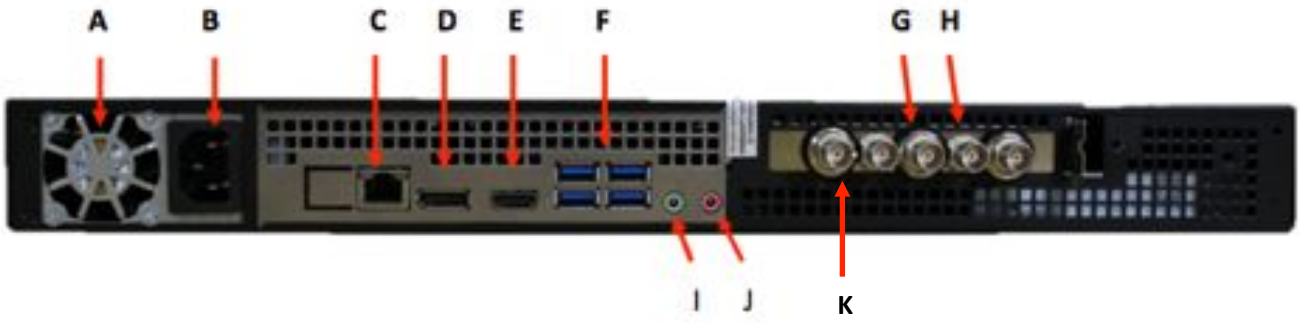
Label	**Record Mode: Controls and Functions Description**
A	**R:** Displays receiver name. To view a different available receiver, click the drop down menu to scroll through the options.
B	**Solo:** When checked, the particular TVUPack will only be shown as “online” on the receiver selected from the drop down menu.
C	**Bitrate/Delay**: Enter the desired transmission Bitrate and delay(s).
D	**Live/Stop Live**: Starts and stops the live transmission.
E	**Apply**: Applies changes made to bitrate, latency, or mode.
F	Displays current TVUPack Receiver ID, TVUPack Transmitter ID, Line Quality, Error Rate and Auto Set.
G	**Mode**: Select an optimized preset bit-rate and latency based on broadcast setting(s) by choosing a different mode.

TVUPack Transceiver

TVUPack Transceiver Front Panel with Faceplate

Label	TVUPack Transceiver Front Panel Faceplate
A	Power Button

TVUPack Back Panel Connections



Label	TVUPack Transceiver Back Panel Connections (SDI)
A	Vent; Do not block
B	AC Power
C	1 GigE Ethernet Port
D	Display Port: Connect the supplied Display Port to VGA adapter (see image below)
E	HDMI Display Port
F	USB Ports
G	SDI Output
H	SDI Input
I	Audio Output
J	Audio Input
K	Reference input: Allows for time sync with the television station's broadcasting system

VGA Adapter

TVU RECEIVER: NETWORK AND FIREWALL CONFIGURATION

TVU Networks recommends assigning a static IP address to the TVUPack receiver to ensure the network configuration remains stable. All the incoming ports referred to in this section are configurable. Please contact TVU Networks Customer Support if you wish to use a configuration other than the one specified in this documentation.

Please configure your firewall or router as follows:

1. Allow TCP outgoing from the TVU receiver on port 3970.
2. Allow UDP/TCP outgoing from the TVU receiver on port 123.
3. Permit all TCP/UDP incoming traffic for port 8088 to receiver.
4. Forward all traffic arriving on port 8088 of the external firewall interface to the IP address of the TVU Receiver.

This setup allows the TVUPack and receiver to automatically link with each other and permit video transport.

Recommended firewall configuration for TeamViewer

TVU Networks uses TeamViewer software to enable remote support and troubleshooting. To enable this software, please ensure that either port 80(TCP) or port 5938(TCP) are open for outbound connections.

Recommended firewall configuration for remote control of TVUPack receiver from iPod or smartphone

The TVUPack hotspot feature allows remote configuration of the TVUPack receiver settings from a smartphone. To enable this feature, permit all TCP/UDP incoming traffic for port 8288 to receiving terminal; forward all traffic arriving on port 8288 of the external firewall interface to the IP address of the TVU Receiver. This port is configurable.

Recommended firewall configuration for the FTP server

This feature allows files to be uploaded to the FTP server in the Receiver. To enable this feature, permit all TCP/UDP incoming traffic for port 21 to the receiving terminal; forward all traffic arriving on port 21 of the external firewall interface to the IP address of the TVU Receiver. This port is configurable.

Recommended firewall configuration for remote configuration of a TVUPack from the receiver

A TVUPack and its modems can now be configured from a remote location. To enable this feature, permit all TCP/UDP incoming traffic for port 22 to the receiving terminal; forward all traffic arriving on port 22 of the external firewall interface to the IP address of the TVU Receiver. This port is configurable.

Recommended firewall configuration for the Return Video Feed

This is a feature that can only be used on a TX3200 or GX3200 series Transceiver. It will allow camera operator in the field have the ability to watch a return video feed from the studio of their Pack transmission or from an SDI input at the Transceiver. To enable this feature, please ensure that you permit all TCP/UDP incoming traffic for port 8488. This port is configurable.

In order to view a TVUPack feed remotely, ensure that port 10003 is open for all inbound traffic.

To view an SDI feed remotely, make sure that port 10004 is open for all inbound traffic.

Note: these are default ports, configurable if required.

For more details, please contact TVU support by phone at +1.650.440.4812, by email at support@tvupack.com, or by skype at skype.tvupack

OPERATING THE TVUPACK RECEIVER

The TVUPack Receiver has two operating modes: Live and Record. You can pair multiple TVUPacks to a Receiver, but can only receive video from one at a time. Depending on your specific license configuration, any number of TVUPacks can be paired with your Receiver.

For owners of the TVUPack Mini HD version, please contact TVU Customer Support at +1.650.440.4812 for instructions on setting up the pack for HD mode.

LIVE VIEWING MODE

Live Mode: Controls and Functions

Label	Live Mode: Controls and Functions Description
A	**System Information:** Displays Receiver Name, PID (unique identifier for TVU Receiver), Build Version, Build Date and Record Time Remaining (if the optional Receiver record option is select).
B	**Status panel:** Displays error rate, line quality, and battery status**.** *See Figure 1A*
C	**Transceiver Information:** Displays the input type and format, the output type and format, and IFB status. *See Figure 1A & 1B*
D	**Refresh button:** Resets the video stream. *See Figure 1A*
E	**Stop buttons (x2):** Clicking on either Stop button ends the live transmission.
F	**Audio level light display**: The two light displays provide visual monitoring of your audio levels. This displays dBFS audio input level at the Receiver.
G	**Mode selection button and mode indicator lights:** Use this button to toggle through the receiver operational modes. *See Mode Selection (page 34) for more information*
H	**Operational mode selection buttons:** Use the operational mode buttons to choose an appropriate capture quality. Each mode has a default bit rate and delay. *See Figure 2*
I	**Bitrate and delay controls:** Sliding bars allow you to manually set the target bit rate and delay levels. *See Figure 2*

Label	Live Mode: Controls and Functions Description
J	**Data card monitor panel:** This monitor panel displays the current status of each data card. *See Figure 3*
K	**Monitor Histogram:** Displays throughput and IP address on each modem (mb/s).
L	**Connection mode and Connection strength indication:** The connection mode is displayed when available in the dark gray box between the carrier name as well as the connection strength. *See Connection Mode and Connection Strength (page 36) for more information*
M	**Reset**: Provides a full power reset for a particular modem. Use this feature when the modem is no longer able to connect or is having problems. On the TM8100, pressing "RESET" will force the modem to reconnect. *See **F** on Figure 3*
N	**Scale:** This drop down menu allows you to set the scale for the histogram graph. Once the scale has been changed, it will affect all of the histogram graphs displayed. Available selections are 1.2Mb/s, 2.4 Mb/s, 6Mb/s, and 12 Mb/s.
O	**Thumbnail of current video feed from TVUPack:** The left-hand column of the TVUPack monitor features an icon of the current feed. If a transmitter is live, a red box will appear around the thumbnail image.
P	**GPS information:** If a TVUPack transmitter is used with modems that support GPS, a display of the transmitter's location can be retrieved. *See GPS Locator (page 36) for more information*
Q	**IFB Indicator:** The IFB indicator is displayed below the transmitter's thumbnail picture. *See page 37*
R	**Stop buttons (x2):** Clicking on either Stop button stops the live transmission.

Status Panel

Arranged vertically on the right hand side of the receiver panel are a number of indicators designed to help an operator make quality and troubleshooting decisions. The status of the transmitter's batteries **(A)**(Figure 1A) is also displayed. See troubleshooting section for more information on interpreting these numbers.

Transceiver Information

Displays input type and input format of the transmitter, which are displayed as T Input and T Format respectively **(B)** (Figure 1A). The output type and output format of the transmitter are shown as R Output and R Format. Lastly, the IFB status is displayed **(C).**

As an added feature, the transceiver output settings can be chosen from the drop down menu in this section **(D)**(Figure 1B)**.** When "Match Input" is selected, the output format of the Transceiver will match that of the input at the transmitter. When "Fixed Setting" is selected, R format will always be set to the default preset that has been configured for the system. Please contact support for inquiries about this feature.

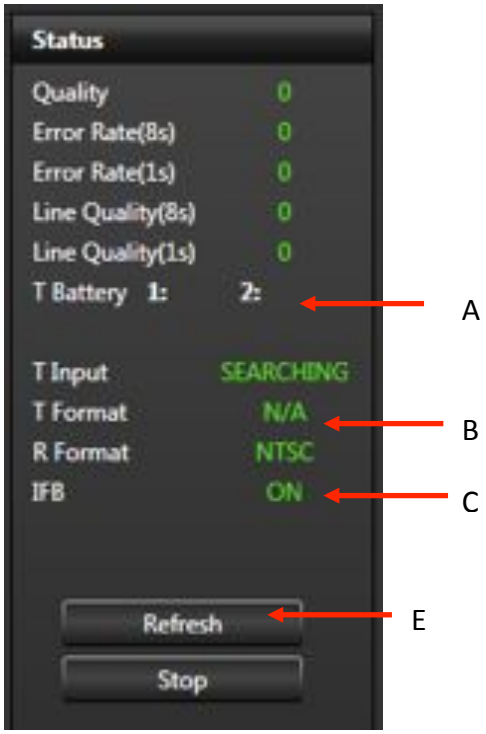


Figure 1A

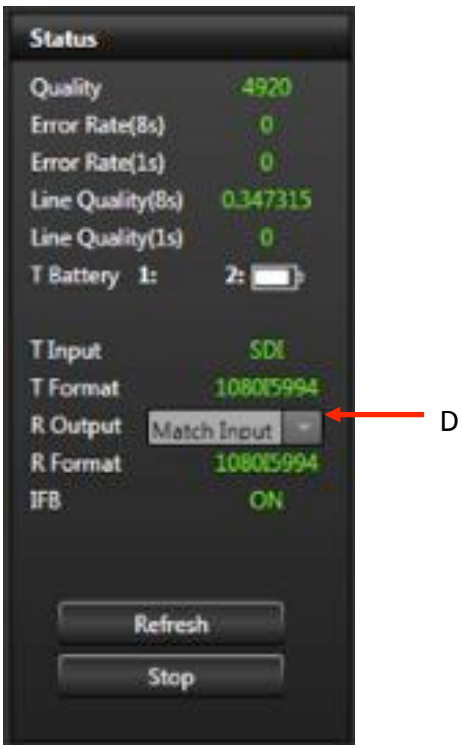


Figure 1B

Refresh Button

If the video goes black or pixelates heavily and does not recover automatically within 15 seconds, click the Refresh button **(E)** (Figure 1A) to reset the video stream and reestablish the connection.

Mode Selection

The currently selected mode displays as a green-lighted tab. The modes that can be chosen are:

- **Live:** Live mode is the primary interface to be used during a live transmission. When this tab is selected, the status of each of the data card network connections is displayed under the "Monitor" section of the interface and the Bitrate, Delay, and Operational Mode buttons are displayed.

- **Record:** Record mode displays the store and forward interface for the preview, download, and management of Pack stored footage and files transferred via Auto Sync. Files transferred via FTP can also be accessed via this interface.

Operational Mode Selection

Depending on your news gathering environment, you can choose from the following preset bitrates and latencies (Figure 2):

- Interview: Bitrate 2048, delay 2 seconds.

- Normal: Bitrate 5120 delay 4 seconds.
- Fast Moving: Bitrate 5120, delay 8 seconds.
- SD: Bitrate 2048, delay 4 seconds.
- Tapefeed: Bitrate 20480, delay 10 seconds. This mode is optimized for content with multiple scene changes.

Figure 2

Bitrate and Delay Controls

In general, when manually setting bit rate and delay, it is recommended to adjust these values based on the available network conditions. “VBR” is the recommended encode mode under most conditions **(A)**(Figure 2). It is recommended that the desired delay is set first and the bit rate slider is moved until the error rate (8s and 1s) is set to zero. Note that the bit rate setting is a target for the system, but as network conditions vary, encode bit rate will automatically adjust accordingly (VBR encoding). If the desired picture quality cannot be achieved based on the network conditions, it may be necessary to increase delay.

Select the “Auto Set” check box once you have set the latency to automatically set the optimal bitrate **(B).** Once “Auto Set” is checked, the bit rate and delay sliders will be grayed out. When you press the LIVE button, a “checking bandwidth” symbol will display next to the checkbox. After a short time, the system will go live. The “Auto Set” mode can be disabled at any time by deselecting the checkbox. The system will return to the previous bit-rate setting.

Note: doing this during a live transmission will interrupt the transmission.

Data card Monitor Panel

The check boxes associated with each cards’ status bar enables or disables a particular data card **(A)**(Figure 3). If unchecked, it will not be used to pass data. If checked on (default), it will be used. Individual read out panels show the carrier name (when available) of each active card

(B). The slot number of each data card is indicated in front of the carrier name **(C).** To retrieve the IP Address of a particular data card, mouse over the name of that data card. If no name is automatically provided and is displayed as <name>, you can input your own name. However, this will reset upon reboot. The color indicators displayed within the carrier name panel indicates the following status:

- **Red**: Not connected
- **Green**: Connected
- **Yellow:** Dialing/Connecting
- **Gray**: Disconnected or unplugged

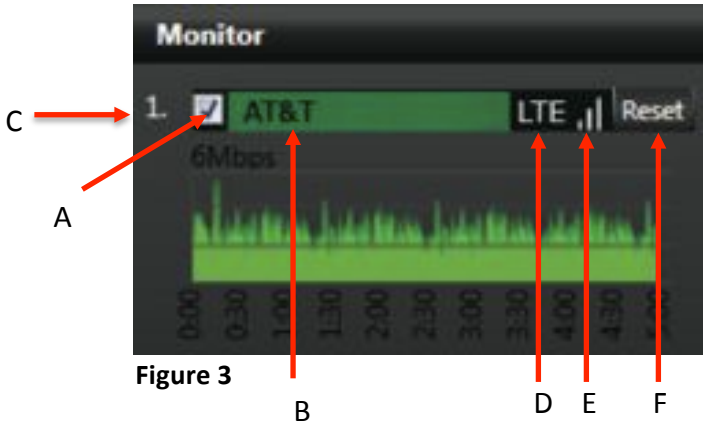


Figure 3

Connection Mode and Connection Strength Indicator

The connection mode **(D)** is next to the connection strength, which is indicated with three status bars **(E)**(Figure 3). If the bars are all gray, there is no connection. Three green bars indicate excellent connection strength.

GPS Locator

When the transmitter is online, its name will be underlined underneath its thumbnail image. By clicking on the underlined name, the GPS data for that individual transmitter will appear. To locate all online transmitters at once, click “Locate All” at the top of the thumbnail column.

IFB Indicator

The five-color indicators are as follows:

- **Red**: IFB function is in use
- **Red-Gray**: Either the transmitter has gone offline and the IFB will recover when it is back online or the transmitter goes live with a different receiver while you were speaking with the Pack via the IFB function
- **Green**: IFB function is connected but not in use
- **Green-Gray**: Either when the transmitter is live with another receiver or when the transmitter is using the IFB function to speak with another receiver
- **Gray:** IFB Function not available for this transmitter

To use the IFB function, click the IFB indicator so that it turns red. The IFB on/off status is also indicated in the "Status" panel on the left side of the interface. Additionally, if a particular TVUPack has an IFB function, the IFB is automatically turned on when that transmitter goes live. Once the live transmission is stopped, the IFB function will be turned off.

Configuring Modem Cards from the Receiver Interface

The modems can be configured on the TVUPack Receiver Interface by taking the following steps:

1) Right click the histogram of the modem you would like to configure

Figure 4

2) A pop-up window will appear with the dial number, APN, and other necessary information

Figure 5

3) Hit “Apply” and the modem will be configured

RECORD / VIEWING MODE

Record mode allows you to preview, download, and delete stored footage.

Figure 6 Record / Viewing Mode Screen

Record Mode: Controls and Functions

Please refer to **Live Mode: Controls and Functions** for a complete description and explanation.

Label	Record Mode: Controls and Functions Description
A	**Download tab - Files monitor panel:** The Download tab shows the status, name, size, and completion percentage of all your downloaded files. Use the four buttons at the bottom of this panel to manage these files: • Stop • Play • Delete • Download
B	**FTP tab**: It is possible to upload video clips from an FTP to the TVUPack Receiver. The files uploaded to the FTP in the receiver will be displayed in this tab. Any type of file can be uploaded to the FTP server and most of the media files can be played back in the FTP tab and output to SDI. For further instructions, see *Uploading Media Content to the Receiver Using the FTP* (p. 46)
C	**Operations mode tab:** This tab displays the current operation mode.
D	**Records control panel:** Each time a video source is switched on and off, the TVUPack

Label	Record Mode: Controls and Functions Description
	automatically creates a new recording on its internal SSD in a FIFO loop. This recording utilizes a completely different encoder than what is used for the Live transmission. This ensures that a high quality of version of any content (whether Live or not Live) is available. *See Records Control Panel (page 41) for more information*
E	**Edit bar:** Use the start and end time triangular cursors on the green edit bar to select the footage to download by time.
F	**Stop buttons (x2):** Clicking on either Stop button stops the preview of footage or the file download.

Note: The recorded content will be recorded at the transmission quality when the TVUPack Mini is "Live". When the TVUPack Mini is in "Standby" mode and is connected to a video source, the recorded content will be recorded at the highest quality possible.

Records Control Panel

The "Records" panel displays the number of recordings for each date on the scroll bar at the top. The green-circled numbers **(A)** that appear next to the dates show how many separate recordings have been captured on that day (Figure 7). Thumbnails of each recording **(B)** will display below the date bar. Each thumbnail also shows the start time for the clip. When you highlight a thumbnail, its start and end times appear in the left-hand column below the "Download All" button. Use the green edit bar below the thumbnails to mark "in" and "out" **(C)** on the recordings for extraction.

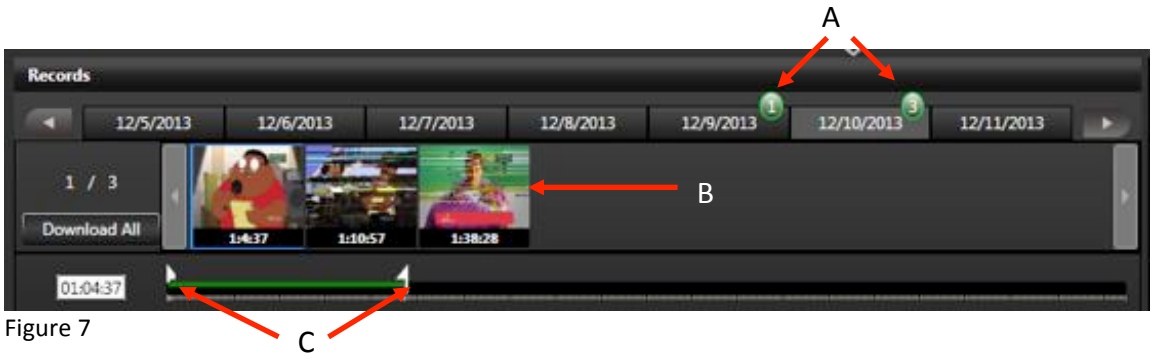


Figure 7

Viewing, Downloading, and Deleting Stored Data

The TVUPack records all video it receives into a first in, first out (FIFO) drive. The last six hours of SD video or 1.5 hours of HD video are available for download from the TVUPack transmitter. After the storage limit is exceeded, the Pack records over the older video.

If the TVUPack is currently in Live mode, begin by selecting **Stop** in the upper left corner. This will stop the live video feed and change the status to Preview. The thumbnail of the current feed will display a stopped camera icon, also indicating no transmission. The system is now ready for managing the stored data. Select the clip you would like to download by clicking on the thumbnail image. Then click "Download". The clip will begin to download in the status box to the right of the thumbnail images (See **A** on Figure 6).

If you need to go back into Live mode, the stored data that is being exported or downloaded will be paused. The process of exporting or downloading will resume once Live mode is disabled again.

Exporting an entire Video Clip

Take the steps outlined below to export an entire video clip:

1. Click on the arrow **(A)** to open the File Export and Rename drop-down menu (Figure 8A & 8B).

2. Select the clip **(B)** to display in the task list **(C)** (Figure 8A and 9)

3. Click on the drop-down menu arrow and select the Export format **(E)** (Figure 9).

4. Rename the exported file in the Save As field **(F)**.

5. Click Export to start the file export process **(G)**.

6. Monitor the progress of the exported file **(D)**.

Figure 8A **Record Mode Controls and Functions Screen**

Figure 9 **Record Mode Controls and Functions Screen**

Figure 8B

Take the following steps to select individual frames in a clip to export:

1. Navigate through stored data history by day or hour **(A)** (Figure 10).
2. Slide the start cursor **(B)** to the start of the time selected (Mark in).
3. Slide the end cursor **(C)** to the end of the time selected (Mark out).
4. Thumbnails of the in and out points will be generated by the system after a few moments.

5. Once the in and out points are selected, use the editing buttons (**D**) to download, play, delete, or stop the process.

6. Select the Export format **(E)** (Figure 11).

7. Re-name the exported file and click the Export button **(F)** to start exporting.

8. Select Export **(G)** to begin the process of preparing the video on the pack for transmission to the receiver.

9. When the file reaches 100%, **(H)** transfer to the Receiver hard drive is complete and ready to be played out.

10. The file can be found under location C:\TVUTransporterR\download\0x_____ where the last section is the unique PID of the TVUPack. On a receiver paired with multiple packs there may be up to 10 of these folders.

1.

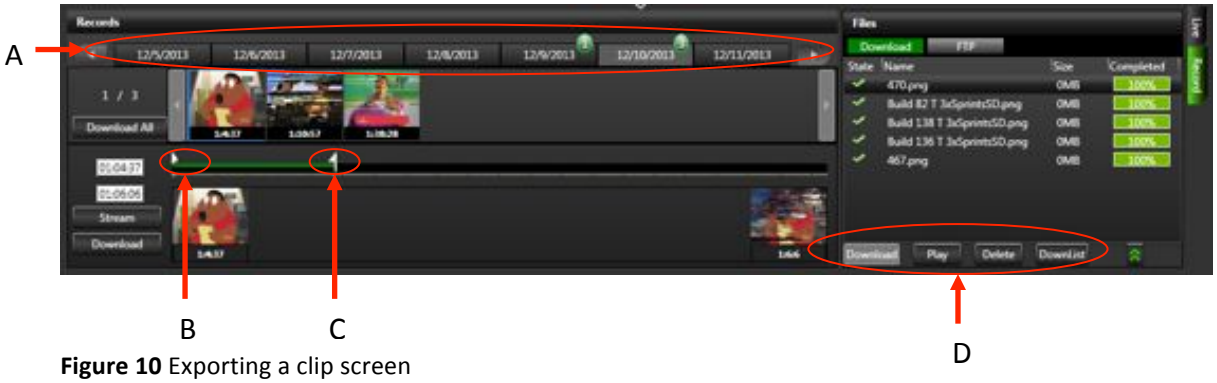


Figure 10 Exporting a clip screen

Figure 11 Exporting a clip screen

Ingestion of Recorded Content Locally to USB Memory Stick

You can quickly and easily download the recorded content locally using a USB memory stick. To do so, simply place a USB memory stick into the spare USB port on the TVUPack Mini encoder unit. TVUPack Mini will auto-detect the memory stick.

Connect your smart device or laptop to the TVUPack Mini Hotspot (See page 18 for *Connecting to Hotspot* instructions). Select the "Record" tab (Figure 12). Input the date (A) when the content was recorded and click "query" (B). The recorded content from the specific date will appear. Select the clip you would to download to the USB by checking the check box to the right of the clip file size (C). Once you have selected the clips you would like to export, click "copy" (D). The file will begin to download to the USB stick and a status bar will appear that will depict the transfer percentage (E).

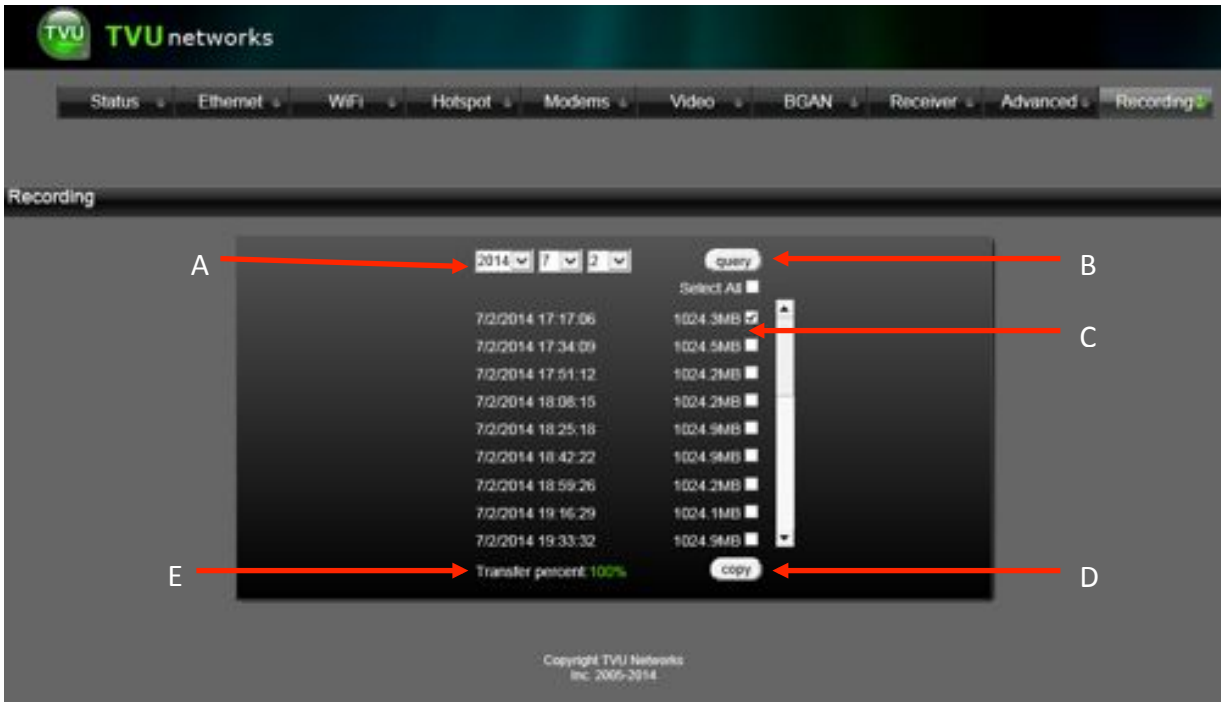


Figure 12

Deleting Uploaded Stored Content

Take the following steps to delete stored content:

1. On the TVUPack Receiver screen, select the Record tab (A) (Figure 13).
2. Select the file you would like to delete (B).
3. Click the Delete button (C).

Figure 13 Delete stored content screen

Uploading Media Content to the TVUPack Receiver Using the FTP

Take the following steps to upload media files from an FTP to the TVUPack Receiver

1. Log in to your usual FTP client

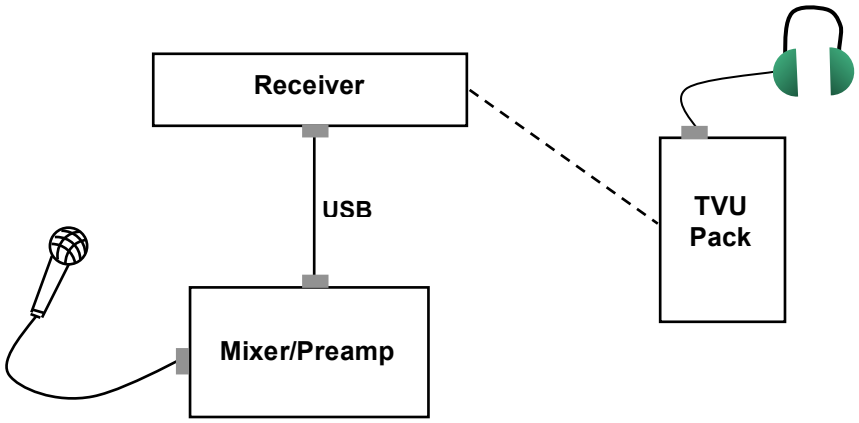
2. Retrieve the IP address of the TVUPack Receiver and plug it into the designated area on the FTP client

3. Type in the username and password of the TVUPack Receiver on the FTP. The username is the last four digits of the PID of the Receiver while the password is the last eight digits of the PID of the Receiver.

4. Drop the files you would like to upload into the FTP and they will be transferred to an FTP folder on the Local (C:) disk drive. These files will appear under the “Downloaded” tab on the TVUPack Receiver Interface.

USING THE IFB FEATURE (OPTION)

The Interruptible Feedback (IFB) feature allows your news operations center to speak directly to a TVUPack in the field without the need for telephone contact. The IFB option includes a mixer/preamp. The mixer has a USB port for connecting to your receiver and an XLR port for plugging in a microphone. Setting up this option is as simple as "plug and play."



On the TVUPack, connect a standard set of headphones to the 3.5mm audio jack on the body of the unit. (Located just to the left of the HDMI connector.) Once the connection between the pack and the receiver is in Live mode, audio will start to pass in real time.

CONTACT TVU NETWORKS

At TVU networks, we value our customers and are committed to ensuring a high level of satisfaction. Should you ever need assistance with your TVUPack Mini, please contact us at one of our numbers below:

Technical Support:
Phone: +1.650.440.4812
Email: support@tvupack.com
Skype: skype.tvupack

Billing Questions:
Phone: +1.650.969.6732

Corporate Address:
857 Maude Avenue
Mountain View, CA 94043

TROUBLESHOOTING VIDEO QUALITY USING THE STATUS INDICATORS IN NORMAL AND ADVANCED MODES.

The Status counters offer a visual indication of specific technical aspects of the current live session. By interpreting these numbers it is possible for an operator to troubleshoot and optimize the quality of a session.

Quality: This is the real time effective bitrate of the transmission. If the system is set to VBR (variable bit rate) mode, this number will fluctuate between the configured maximum bitrate and the lowest bitrate the data connections can currently sustain. The maximum target bitrate is set by either using a preset mode in normal operation, or by using the bitrate slider in advanced mode.

If the system is set to CBR (constant bitrate) this number will stay constant.

Error rate indicators

Error rate 8s: This indicates the percentage of uncorrected errors taken over an eight second average. The aim is for this number to always be at zero during transmission.

Error rate 1s: This indicates the uncorrected error rate over the last second. The aim is for this number to always be at zero during transmission.

All uncorrected errors can contribute to undesirable video glitches. Any error rate greater than zero indicates the data connection is unable to operate cleanly in the current data environment. If attempting to operate in CBR (constant bitrate) mode try either lowering the required bitrate or switching to VBR to allow the system to adapt dynamically to the conditions. If the system is already in VBR mode, try increasing the delay to allow the error correction system more time to adapt to the network conditions.

Line quality indicators

Line quality shows the current error correction levels required for error free transmission at the configured settings.

Line Quality 8s: This is the level of error correction (averaged over the last eight seconds) required to sustain clean transmission.

Line Quality 1s: This is the current level of error correction the system is using to sustain a clean transmission.

The TVUPack Mini uses multiple methods of error correction to ensure smooth clean video transmission in very challenging environments. Since the underlying network conditions are always a factor when working over multiple connections simultaneously, some error correction is always required. As a rule in difficult environments, the lower the latency, the more data is required for error correction to sustain a stable video transmission. This error correction, while highly effective, utilizes some of the limited bandwidth that is available in most situations. It is

desirable where possible to limit the error correction required as it allows the system bandwidth for extra video quality.

Operational Example 1: TVUPack Mini is being operated in a poor data service environment.

In this scenario the receiver is set to Normal VBR mode, but the pack is inside a building with poor data service. The Quality indicator will fluctuate between 2048 and 1000 as the signal strength and available data service varies. This indicates that the pack is using TVU's Inverse Statmux to measure the available bandwidth and maximize throughput on a continuous basis. If the video quality is fluctuating two approaches may be used at the receiver to improve the video output consistency and stability.

Suggestions:

- Try increasing the delay in 1s increments to allow the pack extra time to compensate for the dips in available bandwidth.
- Try incrementally reducing the maximum bitrate so the fluctuations between high and low are less noticeable.

Operational Example 2: TVUPack Mini is being operated in an environment with excellent data service.

In this scenario the receiver is set to Normal VBR mode and all data cards are performing well. The Quality indicator stays constant at 2048 and rarely fluctuates. Under these conditions it is possible that by switching to advanced mode and either increasing the bitrate (for improved video quality) or lowering the latency (for lower delay) may be practical. No action is required, but the system may be capable of enhanced performance if desired.

Suggestions:

- Try increasing the bandwidth in 256k increments until the Quality indicator starts to become unstable and cannot sustain the new setting.
- Try decreasing the delay in 0.2 second increments until the Quality indicator becomes unstable and does not stay consistent at the maximum bitrate.

Operational Example 3: TVUPack Mini is being operated in an environment with average data service.

In this scenario the TVUPack Mini is being used in an interview talkback situation. The desire is to minimize latency but the bandwidth available to the system is limited and the Quality indicator is fluctuating between 750 and 1800. Uncorrected errors are appearing in the video output.

Suggestions:

- Try increasing the delay in 0.5 second increments until the uncorrected errors stop appearing.

- If delay is the most important factor, try decreasing the maximum bandwidth in 256k increments until the errors cease.

Operational Example 4: In this scenario the receiver is set to Interview mode, but the pack is inside a building with poor data service. The line quality indicator increases up to approximately 50.00 but the Quality counter is down at 1000 and there are occasional errors. This indicates trouble on the underlying data networks.

Suggestion:

- Try increasing the delay in increments of 0.5 seconds to allow the system time to compensate for poor conditions on the cellular network.

APPENDIX I

TECHNICAL SPECS

Inputs/Outputs

Video/Audio Inputs

- 1 x HD/SD-SDI (BNC) –. w/ embedded 2-ch. audio (Refer to supported input format list (Table 1))
- 1 x HDMI (Type A) - w/ embedded 2-ch. audio (Refer to supported input format list (Table 1))
- 1 x Composite (RCA) – (Refer to supported input format list (Table 1))
- 2 x Analog Audio (RCA) – unbalanced audio input

Note: Input is automatically detected. Can be manually selected using the config interface (if multiple inputs are connected).

Supported input format:

Format	Analog	HDMI	SDI
480I/60	✔	✔	✔
576I/50	✔	✔	✔
480P/60			
576P/60			
720P/60		✔	✔
720P/50		✔	✔
1080P/24		✔	✔
1080P/25		✔	✔
1080P/30		✔	✔
1080I/50		✔	✔
1080I/60		✔	✔

Table 1

Video/Audio Loop Output:

1 x HDMI (Type A) - 720-59.94P/50P, 1080-59.94i/50i, 480-59.94i/, 576-50i w/ embedded 2-ch. Audio.

USB Data card Connection:
Up to 6 x USB2.0 (Type A): Data card slots are activated on a per slot basis. To activate additional slots, contact TVU Networks.

✍ **Note:** Contact TVU Networks for a current recent list of supported modems and information on modem configuration.

USB WiFi Connection (Always use Slot 2):
1 x USB2.0 (Type A): Allows TVUPack Mini to connect to available WiFi networks.

USB HotSpot Connection (Always use Slot 8):
1 x USB2.0 (Type A): Used

IFB Port (Microphone and headphones) – Future:
1 x mini jack – TRRS – (T=Left, R=Right, R=GND, S=Mic)

DC Power Input:
1 x Mini Jack. 11-19V DC (Must be greater than 60W – w/ six data cards +WiFi & Hotspot)

DC Power Output:
1 x Mini Jack. 5V DC (Future Use)

Power Consumption:
17W – without modems

Storage Temperature:
-20℃ to 60℃ (-4°F to 140°F)

Operating Temperature:
0℃ to 40℃ (32°F to 104°F)

Storage Humidity:
Under 85%

Operating Humidity:
30% to 80% RH

Weight:
TM5000/5010 only: 850 grams (30 oz)
Full Size Modem Module Only: 170 grams (6 oz)
Compact Modem Module Only: 155 grams (5.5 oz)

Dimensions:
TM5000/5010 Only: 114mm x 50mm x 158mm (4.5” x 1.97”x 6.22”)
TM5000/5010 + Full Size Modem Module: 114mm x 83mm x 179mm (4.5” x 3.26”x 7.1”)
TM5000/5010 + Compact Modem Module: 114mm x 50mm x 215mm (4.5” x 1.97”x 8.46”)

Compliance:

- CE
- FCC Class A
- C-Tick